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UTILIZATION OF
FLUE-HEATED
TOBACCO BARN
FOR SWEETPOTATO
STORAGE



THE STORAGE OF SWEETPOTATOES is a practice that has attained considerable importance.

If some building which is intended primarily for another purpose can be remodeled so as to serve for keeping sweetpotatoes, it makes possible a material saving in the cost and number of farm buildings.

Such remodeling is possible where flue-heated tobacco barns are used, as the curing of the tobacco is finished before the harvesting season for sweetpotatoes.

This bulletin contains directions for remodeling these structures so they can be used for the dual purpose.

The cost of the necessary modifications is small, and the changes do not impair the structures for their primary use.

UTILIZATION OF FLUE-HEATED TOBACCO BARNs FOR SWEETPOTATO STORAGE¹

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IMPORTANCE OF GOOD STORAGE

The old practice of storing sweetpotatoes in pits, banks, or cellars built under ground is very unsatisfactory, as 40 per cent or more of roots so stored may be lost from decay. Those that do not decay are, as a rule, of poor quality and do not keep well after their removal. Since it is not practicable to open such storage pits in cold or rainy weather, it is oftentimes impossible to take advantage of the best opportunity for disposing of the crop. Furthermore, it is not economical to store sweetpotatoes under such conditions, as it requires more labor to build banks annually than is necessary to store the sweetpotatoes in a properly constructed storage house. The saving in labor would in a few years offset the cost of remodeling the tobacco barn, as suggested in the following pages.

The remedy is to put the sweetpotatoes in a storage house where they can be properly cured and cared for during the storage season and taken out at any time without fear of subjecting those remaining to unfavorable weather conditions.

To keep sweetpotatoes in good condition they must be (1) well matured before digging, (2) carefully handled, (3) well dried or cured after being put in the house, and (4) kept at a uniform temperature after they are cured.

TYPES OF FLUE-HEATED TOBACCO BARNs

The construction of a flue-heated tobacco barn is similar in principle to that of a sweetpotato storage house. The walls of both houses are usually double, or air-tight, and so constructed that the effect of the outside temperature can be reduced to a minimum.

¹ The experimental work on which this bulletin is based was carried on by the Bureau of Plant Industry in cooperation with the Pee Dee Experiment Station, Florence, S. C. Credit is due R. E. Currin, formerly of that station, for supplying the equipment used in conducting the work and for his assistance in planning and carrying out the details of the experiments.

² Revised and condensed by Howard H. Zimmerley, formerly Senior Olericulturist, Division of Horticultural Crops and Diseases, Bureau of Plant Industry.

Both have provision for roof and floor ventilation and are equipped with heating devices.

Tobacco barns are usually built in two sizes, 16 by 16 feet with 16-foot walls, or 20 by 20 feet with 20-foot walls. The plan of con-

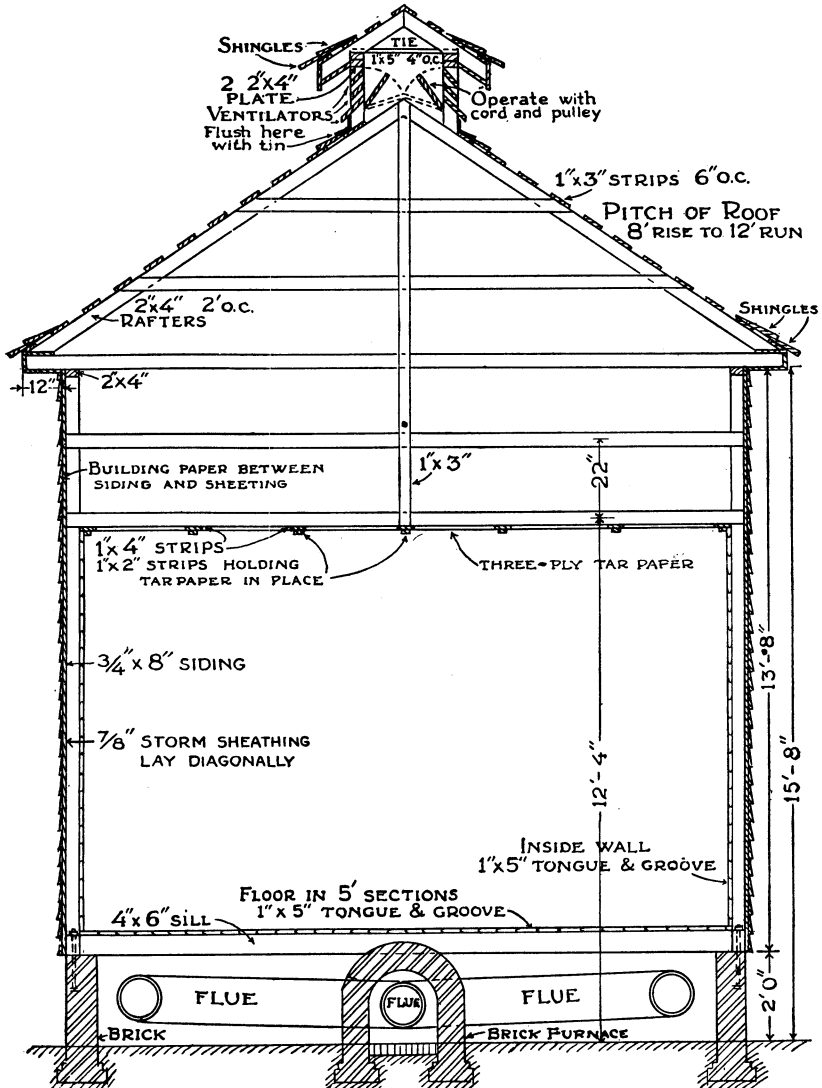


FIGURE 1.—Plan showing the end of a frame tobacco barn when converted into a sweetpotato storage house

struction is shown in Figure 1. Many log barns are used, with logs or poles notched at the ends and made tight by "chinking" or "daubing" with mud, or, better, with ordinary plaster. Either the frame or log barn can be used for sweetpotato storage, as both types of houses are heated by furnaces, with 12 or 14 inch flues extending

into the houses, as shown in Figure 2. This method of heating can be used satisfactorily for curing sweetpotatoes and during the storage period when it is advisable to raise the inside temperature.

CONVERTING A TOBACCO BARN FOR SWEETPOTATO STORAGE

After the tobacco-curing period is over it is well to get the barn in shape for storing sweetpotatoes. The following directions are given for converting a 16 by 16 foot tobacco barn for sweetpotato storage.

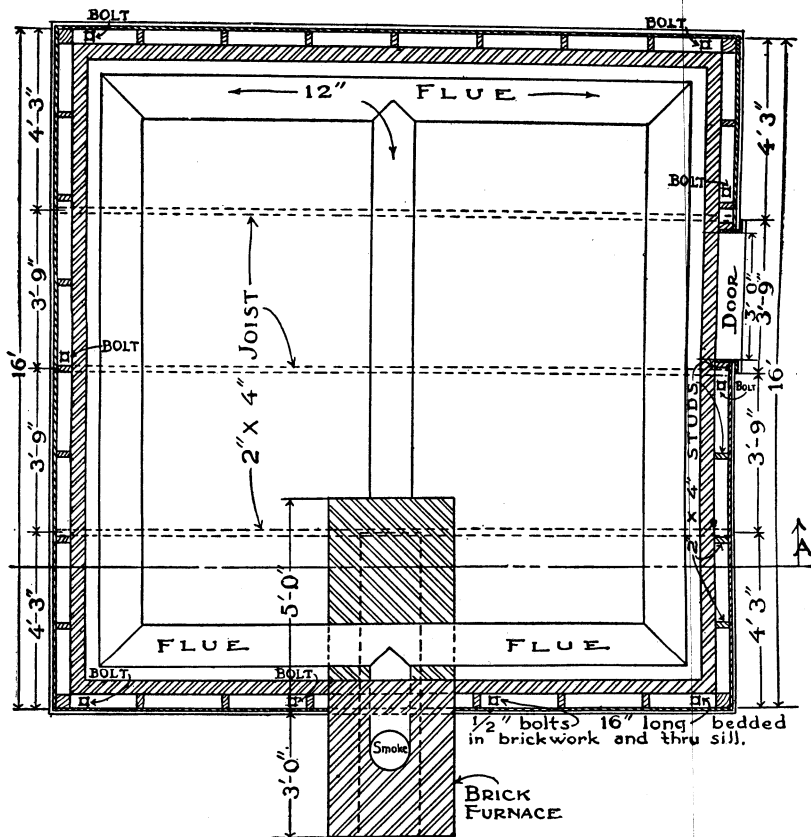


FIGURE 2.—Ground-floor plan of a single-frame tobacco barn, showing arrangement of furnace and flues, also foundation and side walls

The furnace and flues should be gone over and made tight. Remove the tier poles to the height of 10 feet from the top of the foundation and lay them aside until the house is again used for curing tobacco.

In a frame barn with no inside wall (fig. 1), seal over the studding with matched lumber from the foundation to the top of the storage wall or first row of tier poles. This inside wall should fit tightly at the foundation. At the top the openings between the studding and the outer and inner walls should be covered, in order to prevent circulation between the walls and to make this as nearly as possible a dead-air space. Many tobacco barns have this inner wall of matched

lumber. It is not necessary to seal the inside of a log barn, but the walls should be gone over to make sure that the mud or plaster between the logs is tight and secure.

For floor support, two piers of the height of the foundation are evenly spaced on a center line on the inside. One girder 4 by 6 inches by 16 feet rests at each end on the foundation wall and is supported in the center by the two piers. Seven joists, 2 by 8 inches by 16 feet, placed 2 feet apart at right angles to the girder, rest on the foundation at the ends and the girder in the center. The floor is constructed of 1 by 5 inch tongue-and-groove flooring and is made in 4 by 14 foot sections, so spaced that it fits tightly over the joists. The last sections put in should be jammed down in order to make a tight floor. The floor sections, joists, and girders are not nailed, but are simply made to fit evenly so as to be removed easily. It may be necessary, however, to hold the girder and joist in place by tacking the ends.

For ceiling, nail 1 by 4 inch strips on the underside of the tier poles, spaced 34 inches apart on center. Tack 3-ply tar paper to the underside of the strips, holding it in place by $\frac{1}{2}$ by 2 inch strips. Use a strip for fastening the ceiling tar paper against the side walls in order to make them tight.

If the tobacco barn is not already fitted with wall ventilators, make three openings, each about 18 by 24 inches, on either side of the barn, between the temporary floor and the ground, and provide these with sash or doors. Cut a 12 by 12 inch ventilator in each corner of the floor and one in the center. Provide tight-fitting covers for them. Cut two 12 by 12 inch ventilators in the tar-paper ceiling; build a frame around them in order to allow a cover. Space the ceiling ventilators 6 feet from the side wall on a center line.

The door should be made tight, double if necessary, and padded.

A small window with a tight-fitting shutter above the door will admit light for working inside during cold weather. Great care should be taken to make all openings tight, as success depends on tight walls in order to control the inside temperature.

The following is the bill of materials for converting a 16 by 16 foot tobacco barn at the Pee Dee Experiment Station, Florence, S. C., where it was necessary to add an inside wall:

For piers: One 4 by 8 inch by 6 feet (two piers).

For girder: One 4 by 6 inch by 16 feet.

For joists: Seven 2 by 8 inch by 16 feet.

For flooring (including 20 per cent waste): 300 feet of 1 by 5 inch, tongue and groove.

For inside wall (including 20 per cent waste): 768 feet of 1 by 5 inch, tongue and groove.

For ceiling: Five 1 by 4 inch by 16 feet; five half inch by 2 inch by 16 feet (for fastening tar paper to the tier poles); $2\frac{1}{2}$ rolls of 3-ply tar paper.

Miscellaneous: One 4-light window sash; two pairs of 6-inch strap hinges for a window shutter.

The cost of material for converting the tobacco barn into a sweet-potato storage house amounted to \$71.03, figuring lumber at \$45 per thousand feet. The labor required consumed the time of two men for $2\frac{1}{2}$ days. This work can be done by the average farm laborer. After the first year the cost is only for the labor required in converting the barn, as the walls remain permanent, and the ceiling, floor, and floor supports can be removed easily and used indefinitely for several years.

STORING IN CRATES AND BINS

In this experiment both crates and bins were used, although the crates were preferred on account of ease in handling.

Where crates are used, a slat floor raised 4 inches from the main floor should be provided in order to allow air circulation under the crates, and they should be stacked in even rows on it to the height of 8 feet. A satisfactory substitute method is to stack each row of crates on two 2 by 4 inch pieces set on edge, parallel to each other, and about 1 foot apart. This is important in order to protect the sweetpotatoes in the first row of crates.

It is hardly possible to construct an upright bin in sections so that it can be quickly put together and taken down, but a satisfactory bin can be constructed as shown in Figure 3. The sides, floors, and ends can be made separate and held together by cleats.

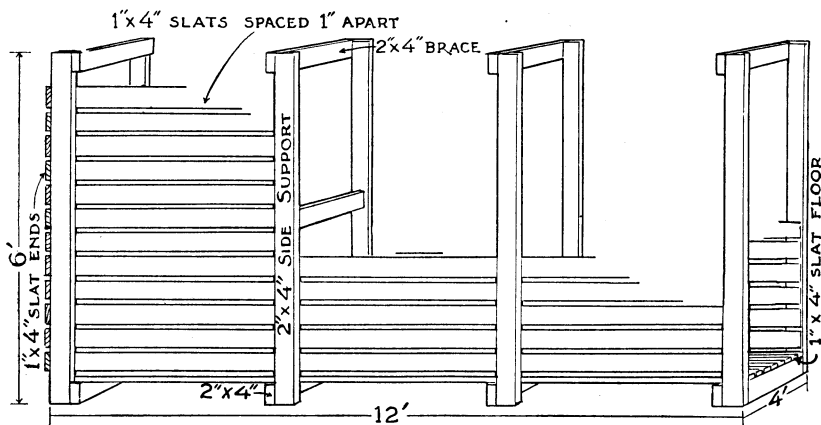


FIGURE 3.—Diagram showing construction of a bin for storing sweetpotatoes in a tobacco barn.

Results during the season of 1919-20 in storing sweetpotatoes in modified tobacco barns at the Pee Dee Experiment Station show that in the bin, during the storage period from November 10, 1919, to March 25, 1920, the shrinkage amounted to 11.2 per cent and the decay to 4.75 per cent. In crates, during the storage period from November 7, 1919, to March 24, 1920, the percentage of shrinkage was 7 and of decay 1.7.

STORAGE-HOUSE MANAGEMENT

HARVESTING

Sweetpotatoes should be harvested as soon as mature and before hard frosts occur, for if left in the ground they are liable to be chilled, thus bringing about conditions favorable for decay in storage. It is important that the sweetpotatoes be mature at harvesting time. This can be determined by cutting in half a full-grown sweetpotato and allowing the cut surface to be exposed to the sun for half an hour. If the cut surface dries, the sweetpotato is mature, but if the sap continues to flow and remains sticky it is well, if possible, to postpone the harvesting until the test is favorable.

Careful handling of the sweetpotatoes is essential. A satisfactory implement for digging sweetpotatoes is a plow with rolling colters for cutting the vines. After the sweetpotatoes are dug they should be scratched out by hand and allowed to dry. It is a bad practice to throw several rows together, as the sweetpotatoes will be bruised and be more susceptible to decay. The best plan is to pick up the sweetpotatoes direct from the row, place them in crates, and transport them on a spring wagon to the storage house, where the crates are stacked in the manner already described or the sweetpotatoes carefully placed in the bins.

The sweetpotatoes should be graded in the field in order to separate the cut and bruised from the uninjured ones, as this will eliminate extra sorting at the storage house. The cut and bruised sweetpotatoes should be disposed of as soon as possible.

CURING

It is a good plan to start the fire a day before beginning to fill the barn so as to dry out the house thoroughly. It should be remembered that the furnace and piping in a tobacco-curing barn are designed to maintain a high temperature and that after the wooden floor is installed for the storage of sweetpotatoes considerable caution must be exercised or the building may be set on fire. On bringing in the sweetpotatoes the fire should be continued and the ventilators in the floor or roof opened as wide as possible. A temperature of 85° to 90° F., with plenty of ventilation, should be maintained for about 10 days, or until the eyes of the sweetpotatoes on the top of the pile turn pink, showing signs of sprouting. This curing process is simply driving the excess moisture from the sweetpotatoes by means of heat, which creates air circulation. The temperature inside the storage house during the curing period is higher than that outside, and as the cool air enters through the wall ventilators it warms, expands, and rises. As it rises and circulates around the sweetpotatoes it expands and takes up moisture and carries this moisture out through the roof ventilators.

After the curing period the temperature should be gradually reduced to 50° or 55° F. and held as nearly as possible at this point through the remainder of the storage period. When the thermometer registers as low as 45° the fire should be started and the temperature raised, the ventilators being kept open. If the temperature runs above 60° the barn should be opened on a cool night until the temperature inside is lowered to the desired point. It is well to give the barn some ventilation every day unless the weather is damp and rainy, when it may be advisable to close all ventilators. The ventilators and fires should be so managed that moisture is not allowed to collect on the interior walls or windows.

PUBLICATIONS ON SWEETPOTATOES

For further information on varieties and cultural methods, see Farmers' Bulletin 999, Sweet-Potato Growing.

For information on storage-house construction, see Farmers' Bulletin 1442, Storage of Sweet Potatoes.

For information on diseases, see Farmers' Bulletin 1059, Sweet-Potato Diseases.